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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/565,767	01/24/2006	Yuichiro Shindo	OGOSH43USA	2990

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EXAMINER	
SHEVIN, MARK L	

ART UNIT	PAPER NUMBER
1733	

NOTIFICATION DATE	DELIVERY MODE
10/19/2010	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/565,767	SHINDO, YUICHIRO	
	Examiner	Art Unit	
	MARK L. SHEVIN	1733	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 September 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,28 and 30-35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 28, and 30-35* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Status of Claims

1. Claims 1, 28, and 30-35, filed September 21st, 2010, are currently under examination.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 103

2. **Claims 1, 28, and 32-34** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Shindo** (US 2003/0062261 A1).

Shindo is drawn to high purity zirconium or hafnium with minimal impurities (Abstract). Shindo discloses in Example 2, beginning at para 0120 a high-purity hafnium sputtering target or thin film formed with said target (claim 4 and Title) with 4N (99.99%) purity level excluding gas components such as carbon, oxygen, and nitrogen (para 0133) however this is not taken as the maximum purity suggested to one of ordinary skill for the following reasons:

For his Hf sputtering target, Shindo discloses that impurities other than Zr and gas components should be less than 100 ppm (para 0028), specifically Na and K are 1 ppm or less (para 0029), radioactive elements U and Th are 5 ppb or less (para 0029), total heavy metals or high melting point metal elements such as Fe, Ni, Co, Cr, and Cu are 50 ppm or less (para 0029, less than 10 ppm in Table 4, para 0089, 0131).

With respect to the contents of Zr and gas components, the Zr content should be 0.5wt% or less (para 0031, 0041, 0065, claim 1), the gas components such as C and O are 500 ppm or less (para 0030), with N present at less than 10 ppm (Table 4, para 0089).

Overall, the contents of the impurities disclosed by Shindo with the language used of "less than X ppm" or "less than X wt% suggests the formation of as pure of hafnium as possible, with a specific examples of 4N, but also implicitly suggests the formation of even higher purities, up to pure hafnium.

While Shindo does not specifically state that his hafnium sputtering targets are 4N5 to 6N, as stated in the preceding paragraph, the contents of impurities disclosed by Shindo implicitly suggest the formation of 4N or higher purity hafnium sputtering targets and hafnium thin films. Shindo discloses overlapping ranges of Zr, C, O, N, Fe, Cr, and Ni and an overlapping range of Hf purity by virtue of the implicit teachings as stated above.

It would have been obvious to one of ordinary skill in sputtering targets, at the time of the invention, to select any portion of the claimed ranges of impurities, including the claimed ranges, from the overlapping ranges disclosed in Shindo because Shindo finds that the prior art sputtering targets and thin films in the entire disclosed ranges have a suitable utility and the normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages and in the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior

art" a *prima facie* case of obviousness exists. Furthermore, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation (MPEP 2144.05, section I, para 1 and section II, A, para 1)

Furthermore, even if Shindo is seen as only disclosing Hf sputtering targets/thin films with a maximum purity of 4N, a prima facie case of obviousness still applies in that where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties. *Titanium Metals Corp. of America v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985). Both Shindo and the instant invention are directed to hafnium sputtering targets or thin films for electronics and in the absence of evidence showing an unexpected result or criticality regarding the instant claims' increased purity of 4N5 (99.995) compared to (4N) 99.99 of Shindo, one of one skilled in the art would have expected the two sputtering targets to have the same properties.

This is all the more salient in that the mere purity of a product, by itself, does not render the product unobvious. *Ex parte Gray*, 10 USPQ2d 1922 (Bd. Pat. App. & Inter. 1989) (MPEP 2144.04, VII, para 1). See also *Ex parte Hartop* , 139 USPQ 525 (Bd.App. 1962); *Ex parte Steelmand* , 140 USPQ 189 (Bd.App. 1962); *In re Mehta* , 52 CCPA 1615, 347 F.2d 859, 146 USPQ 284 (1965), and *In re Anthony* , 56 CCPA 1443, 414 F.2d 1383, 162 USPQ 594.

3. **Claims 30, 31, and 35** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Shindo** (US 2003/0062261 A1) as applied to claims 1, 28, 32-34 above, in further view of **Segal** (US 2003/0052000 A1).

The disclosure of Shindo was discussed above, however Shindo does not disclose his sputtering target body having a forged and rolled microstructure.

Segal:

Segal, drawn to methods of forming sputtering targets (para 0001), discloses that sputtering targets and thin films made of Hf (para 0010, 0011, 0038)

Segal, like Shindo, is directed to the issue of using sputtering targets in the manufacture of semiconductors (para 0030) and teaches that sputtering targets having a narrow distribution of grain sizes and fine mean grain size may be beneficial and that such a microstructure reduces micro-arcing and generation of particles (para 0032) by eliminating large grains.

Segal discloses that sputtering targets may be subjected to a severe plastic deformation process such as equal channel angular extrusion (ECAE) following by the conventional methods of forging, cross-rolling, and rolling to form a sputtering target into a suitable shape to be utilized as a target in a sputtering process (para 0091 and 0097).

Regarding claim 30 and 31, it would have been obvious to one of ordinary skill in sputtering targets, at the time of the invention, to have at least further forged and rolled the sputtering target of Shindo as taught by Segal so as to form a sputtering target material into a suitable shape to be utilized as a target in a sputtering target and to create fine and homogenous microstructure that has reduced micro-arcing and

generation of particles, particularly when sputtering in the manufacture of semiconductors (para 0030, 0032).

Regarding claim 35, this claim is rejected for the same rationale as applied to claims 28 and 33 in section 2 above with the addition that Shindo's disclosed Zr content of less than 0.5 wt% is assumed to be "throughout the sputtering target body" in the absence of an teaching that the concentration is only valid locally or on the outer surface.

4. **Claims 1, 28, and 32-34** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Murray** (G.T. Murray and T.A. Lograsso, Preparation and Characterization of Pure Metals, *ASM Handbook, Vol. 2,* (1995), p. 1093-1097).

Murray:

Murray discloses (p. 1094, col. 3) that if a low-iron starting metal is used, chemical vapor deposition will produce a condensed vapor with a purity level of 99.999% (5N) and hafnium is one of the metals that have purified by chemical vapor deposition. Murray teaches that if the proper temperature is maintained during the chemical vapor deposition process, oxygen, nitrogen, hydrogen, carbon, as well as many metallic impurities will not be carried over. Murray does not teach the contents of C, O, N, Fe, Cr, and Ni.

Regarding claims 1 and 32, Murray discloses a method for making a very pure Hf material (and thus implicitly teaches a very pure hafnium material as a result) with an overlapping purity of up to 99.999% (5N), which means an overlapping Zr content of not

more than 10 ppm as purity is assumed to mean the Hf content by weight percent in a given sample compared to all other elements in the absence of evidence to the contrary. Murray further disclosed that if the proper temperature is maintained, O, N, H, C, and other typical metal impurities would not be carried over.

The Examiner notes that the purity of the hafnium disclosed by Murray overlaps the purity of the instant invention as claimed which is prima facie evidence of obviousness (see MPEP 2144.05 I). Thus it would have been obvious to one of ordinary skill in the metallurgical arts at the time the invention was made, to choose the instantly claimed ranges through process optimization, for the same reasons as stated in the rejections in section 2 above, see MPEP 2144.05.

With respect to the recitation “A sputtering target or thin film formed therefrom comprising a sputtering target or thin film made of a high purity hafnium material…”, the Examiner notes that although Murray does not specify the size or shape of the hafnium metal, "a sputtering target or thin film" is not defined to exclude any specific size or shape of metal. Furthermore, changing the size/proportion of the hafnium metal would not patentably distinguish over the prior art, (see MPEP 2144.04 IV).

Regarding claims 28, 33, and 34, while Murray does not disclose forming Hf of a purity of 6N, a prima facie case of obviousness still applies in that where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties for the same reasons as stated in the rejections in section 2 above, in this case being even more relevant in that

the difference between 5N and 6N (0.0009) is smaller than that between 4N and 4N5 (0.005).

5. **Claims 30, 31, and 35** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Murray** (G.T. Murray and T.A. Lograsso, Preparation and Characterization of Pure Metals, *ASM Handbook, Vol. 2,* (1995), p. 1093-1097) as applied to claims 1, 28, 32-34 above, in further view of **Segal** (US 2003/0052000 A1).

The disclosures of Murray and Segal were discussed above however Murray did not disclose sputtering targets with a forged and rolled microstructure.

Regarding claims 30 and 35, it would have been obvious to one of ordinary skill in sputtering targets, at the time of the invention, to have at least further forged and rolled the hafnium material of Murray into a sputtering target shape as Segal teaches that forging and rolling are performed to form a sputtering target material into a suitable shape to be utilized as a target in a sputtering target and to create fine and homogenous microstructure that has reduced micro-arcing and generation of particles, particularly when sputtering in the manufacture of semiconductors (para 0030, 0032).

Regarding claim 31, this claim is rejected under the same rationale as stated for the rejections of claims 28, 33, and 34 as stated in section 4 above.

Response to Applicant's Arguments:

6. Applicant's arguments filed September 21st, 2010 have been fully considered but they are not persuasive.

Applicants assert (p. 7, para 1 to p. 8, para 1) that Shindo does not disclose an overlapping purity and that Shindo fails to teach, suggest, or disclose a hafnium material having a purity of 4N5 to 6N.

While Shindo does not specifically state that his hafnium sputtering targets are 4N5 to 6N, as stated in the preceding paragraph, the contents of impurities disclosed by Shindo implicitly suggest the formation of 4N or higher purity hafnium sputtering targets and hafnium thin films. Shindo discloses overlapping ranges of Zr, C, O, N, Fe, Cr, and Ni and an overlapping range of Hf purity by virtue of the implicit teachings as stated above.

It would have been obvious to one of ordinary skill in sputtering targets, at the time of the invention, to select any portion of the claimed ranges of impurities, including the claimed ranges, from the overlapping ranges disclosed in Shindo because Shindo finds that the prior art sputtering targets and thin films in the entire disclosed ranges have a suitable utility and the normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages and in the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a *prima facie* case of obviousness exists. Furthermore, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation (MPEP 2144.05, section I, para 1 and section II, A, para 1)

Furthermore, even if Shindo is seen as only disclosing Hf sputtering targets/thin films with a maximum purity of 4N, a prima facie case of obviousness still applies in that where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties. Both Shindo and the instant invention are directed to hafnium sputtering targets or thin films for electronics and in the absence of evidence showing an unexpected result or criticality regarding the instant claims' increased purity of 4N5 (99.995) compared to (4N) 99.99 of Shindo, one of one skilled in the art would have expected the two sputtering targets to have the same properties.

Applicants assert (p. 8, para 3 to p. 10, para 1) that the disclosure of 0.5% or less does not overlap the ranges recited in the claims of the present application when the teachings of Shindo are fairly considered and that the numerical range of Zr content should be limited to an achievable range based on the technical level of purification disclosed by Shindo. Furthermore, it would not be obvious to one of ordinary skill in the art to optimize the range because separation and refinement between Hf and Zr is difficult.

In response, Shindo discloses an overlapping range of Zr content and the Examiner notes that the instant claims are product claims, not process claims, thus the differences in the methods of manufacturing are moot in the absence of evidence showing that the claimed Zr content cannot be achieved using the methods of Shindo. Note, that a reference is presumed operable until applicant provides facts rebutting the presumption of operability. *In re Sasse*, 629 F.2d 675, 207 USPQ 107 (CCPA 1980).

Therefore, applicant must provide evidence showing that a process for making was not known at the time of the invention (MPEP 2121.02). Furthermore, no objective evidence (including Applicants' affidavit) has been provided establishing that no method was known to those skilled in this field whereby the claimed material might have been synthesized (MPEP 2144.04, Section VII, para 4).

Applicants assert (p. 11, para 1) that the present invention succeeding in reducing Zr content in a hafnium material to a level that was not achievable by one of ordinary skill in the art following the teaching of Shindo. Consequently Applicants were able to realize "a stable permittivity in a state-of-the-art fine gate insulation film formed using the high –purity hafnium sputtering target", "realize the mass production of semiconductor devices comprising these favorable characteristics", and "yield an effect that was unexpected in the past and that achieved commercial success".

In response, Applicants have not produced any objective, quantitative evidence beyond allegations of unexpected results (MPEP 716.02) and the present record lacks any evidence to support Applicants' remarks. Furthermore, there is no evidence or explanation of how reduced Zr content relative to Shindo would amount to a patentable distinction in view of assumption that the mere purity of a product, by itself, does not render the product unobvious.

Applicants assert (p. 12, para 2 to p. 14, para 3) that Murray fails to disclose a hafnium material of 5N purity in that the disclosure that the condensed vapor will approach a purity level of 99.999% is a specific reference to Ti, Zr, and Cr, not every

metal, and that there is no legitimate teaching by Murray as to how to realize a purity level of 4N5 to 6N for a hafnium material.

In response, the Examiner notes that the disclosure in the ASM Handbook to achieve a purity of 99.999% would not necessarily apply to all metals, but rather the disclosed metals which are hafnium, thorium, vanadium, niobium, tantalum, and molybdenum wherein the starting material has a low iron content (p. 1094, right column).

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

-- Claims 1, 28, 30-35 are finally rejected
-- No claims are allowed

The rejections above rely on the references for all the teachings expressed in the texts of the references and/or one of ordinary skill in the metallurgical art would have reasonably understood or implied from the texts of the references. To emphasize

certain aspects of the prior art, only specific portions of the texts have been pointed out. Each reference as a whole should be reviewed in responding to the rejection, since other sections of the same reference and/or various combinations of the cited references may be relied on in future rejections in view of amendments.

All recited limitations in the instant claims have been met by the rejections as set forth above. Applicant is reminded that when amendment and/or revision is required, applicant should therefore specifically point out the support for any amendments made to the disclosure. See 37 C.F.R. § 1.121; 37 C.F.R. Part §41.37 (c)(1)(v); MPEP §714.02; and MPEP §2411.01(B).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mark L. Shevin whose telephone number is (571) 270-3588 and fax number is (571) 270-4588. The examiner can normally be reached on Monday-Friday, 8:30 am to 5:00 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V. King, can be reached at (571) 272-1244. The fax number for the organization where this application or proceeding is assigned is (571) 273-8300.

/Mark L. Shevin/
Examiner, Art Unit 1733

October 12th, 2010
10-565,767

/George Wyszomierski/
Primary Examiner
Art Unit 1733